JUN 5 1989

594-C-9

COMPLETED

FLOOD INSURANCE STUDY

ESCAMBIA COUNTY, FLORIDA

COMMUNITY NAME	COMMUNITY NUMBER
■ PENSACOLA, CITY OF	120082
□ PENSACOLA BEACH, SANTA ROSA ISLAND AUTHORITY	125130
□ ESCAMBIA COUNTY UNINCORPORATED AREAS	120080

AUGUST 19, 1987

Federal Emergency Management Agency

BEST COPY AVAILABLE

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Purpose of Study	1
1.2	Authority and Acknowledgments	1
1.3	Coordination	1
2.0	AREA STUDIED	2
2.1	Scope of Study	2
2.2	Community Description	2
2.3	Principal Flood Problems	4
2.4	Flood Protection Measures	6
3.0	ENGINEERING METHODS	6
3.1	Hydrologic Analyses	7
3.2	Hydraulic Analyses	9
4.0	FLOODPLAIN MANAGEMENT APPLICATIONS	24
4.1	Flood Boundaries	24
4.2	Floodways	25
5.0	INSURANCE APPLICATION	28
5.1	Reach Determinations	28
5.2	Flood Hazard Factors	28
5.3	Flood Insurance Zones	29
5.4	Flood Insurance Rate Map Description	30

BEST COPY AVAILABLE

TABLE OF CONTENTS (Continued)

		Page
6.0	OTHER STUDIES	30
7.0	LOCATION OF DATA	30
8.0	REFERENCES AND BIBLIOGRAPHY	37

FIGURES

Figure	1	-	Vicinity Map	3
Figure	2	-	Transect Location Map	19
Figure	3	-	Transect Schematic	18
Figure	4	-	Floodway Schematic	2 5

TABLES

Table	1	-	Summary of Discharges	8
Table	2	-	Parameter Values for Surge Elevations	10
Table	3	-	Summary of Stillwater Elevations	11
Table	4	-	Transect Locations, Stillwater Starting Elevations, and Initial Wave Crest Elevations	20
Table	5	-	Floodway Data	26
Table	6	-	Flood Insurance Zone Data	31
Table	7	-	Coastal Flood Insurance Zone Data	32

EXHIBITS

Flood Profiles

Escambia River	Panels 01P-03P
Pine Barren Creek	Panels 04P-05P
Thompson Bayou	Panel 08P
Elevenmile Creek	Panels 06P-07P

BEST COPY AVAILABLE

TABLE OF CONTENTS (Continued)

EXHIBITS (Cont'd)

Escambia County
Flood Boundary and Floodway Map Index
Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

City of Pensacola
Flood Insurance Rate Map Index
Flood Insurance Rate Map

Pensacola Beach-Santa Rosa Island Authority
Flood Insurance Rate Map Index
Flood Insurance Rate Map

Escambia County
Flood Insurance Rate Map Index
Flood Insurance Rate Map

BEST COPY AVAILABLE

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

BEST COPY AVAILABLE

FLOOD INSURANCE STUDY

ESCAMBIA COUNTY,
UNINCORPORATED AREAS,
FLORIDA

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Type 19 Flood Insurance Study is to investigate the existence and severity of flood hazards in the Unincorporated Areas of Escambia County, Florida, and the incorporated areas of the City of Pensacola and Pensacola Beach-Santa Rosa Island Authority, and to aid in the administration of the Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to revise the Flood Insurance Rate Map developed from data presented in the Type 15 Flood Insurance Study. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain management. Minimum flood plain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

Portions of the hydrologic and hydraulic analyses for this study were performed by Stottler Stagg & Associates and GKY & Associates, Inc. (the Study Contractors) for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-C-0969. The remainder of the analyses were performed by FEMA. This study was completed in August 1984.

1.3 Coordination

This Flood Insurance Study was initialized August 8, 1979, for the City of Pensacola, Pensacola Beach-Santa Rosa Island Authority, and Escambia County in a letter by Mr. John Pekar, Project Manager for Stottler Stagg & Associates. In the letter, a flood information checklist was requested dealing with possible community flood data and sketches or maps confirming the agreed upon study area. Also contained in the letter was an invitation to schedule a community meeting to further explain the study and coordinate field reconnaissance work efforts. Pertinent information was collected and survey crews began work shortly thereafter.

BEST COPY AVAILABLE

The results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractors, FEMA, and the communities of Pensacola and Escambia County on September 17, 1986, and Pensacola Beach-Santa Rosa Island Authority on September 16, 1986.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Escambia County, Florida, and all of the incorporated areas within the county except the City of Century. This group includes the City of Pensacola and Pensacola Beach-Santa Rosa Island Authority. The area of study is shown on the Vicinity Map (Figure 1).

Riverine areas studied by detailed methods were selected based upon the extent and validity of available existing hydrologic and hydraulic data. Riverine areas studied in detail include: Pine Barren Creek from its mouth to just upstream of Wiggins bridge; Thompson Bayou, from its mouth to about 2.4 miles upstream; Elevenmile Creek, from its mouth to about 6,300 feet upstream of the confluence of Eightmile Creek; and the Escambia River, from U.S. Route 90 to about 6.4 miles upstream of the confluence of Pine Barren Creek.

A detailed coastal flooding analysis was performed on the complete coastline of Escambia County, where the flooding sources are the Gulf of Mexico, Escambia Bay, Santa Rosa Sound, Pensacola Bay, and Perdido Bay.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through August 1989. The scope and methods of study were proposed to, and agreed upon by FEMA and Escambia County.

2.2 Community Description

Escambia County is located in the northwestern portion of the Florida Panhandle. It is the westernmost county of the state, sharing its western and northern border with the State of Alabama. The county is bordered by the unincorporated areas of Baldwin County, Alabama, on the west; the unincorporated areas of Santa Rosa County on the east; and the unincorporated areas of Escambia County, Alabama, and the Town of Flomaton, Alabama, on the north. Escambia County has 40 miles of shoreline on the Gulf of Mexico, as well as about 40 miles on Pensacola, Perdido, and Escambia Bays. The Escambia River serves as the eastern border separating Escambia County and Santa Rosa County.

BEST COPY AVAILABLE

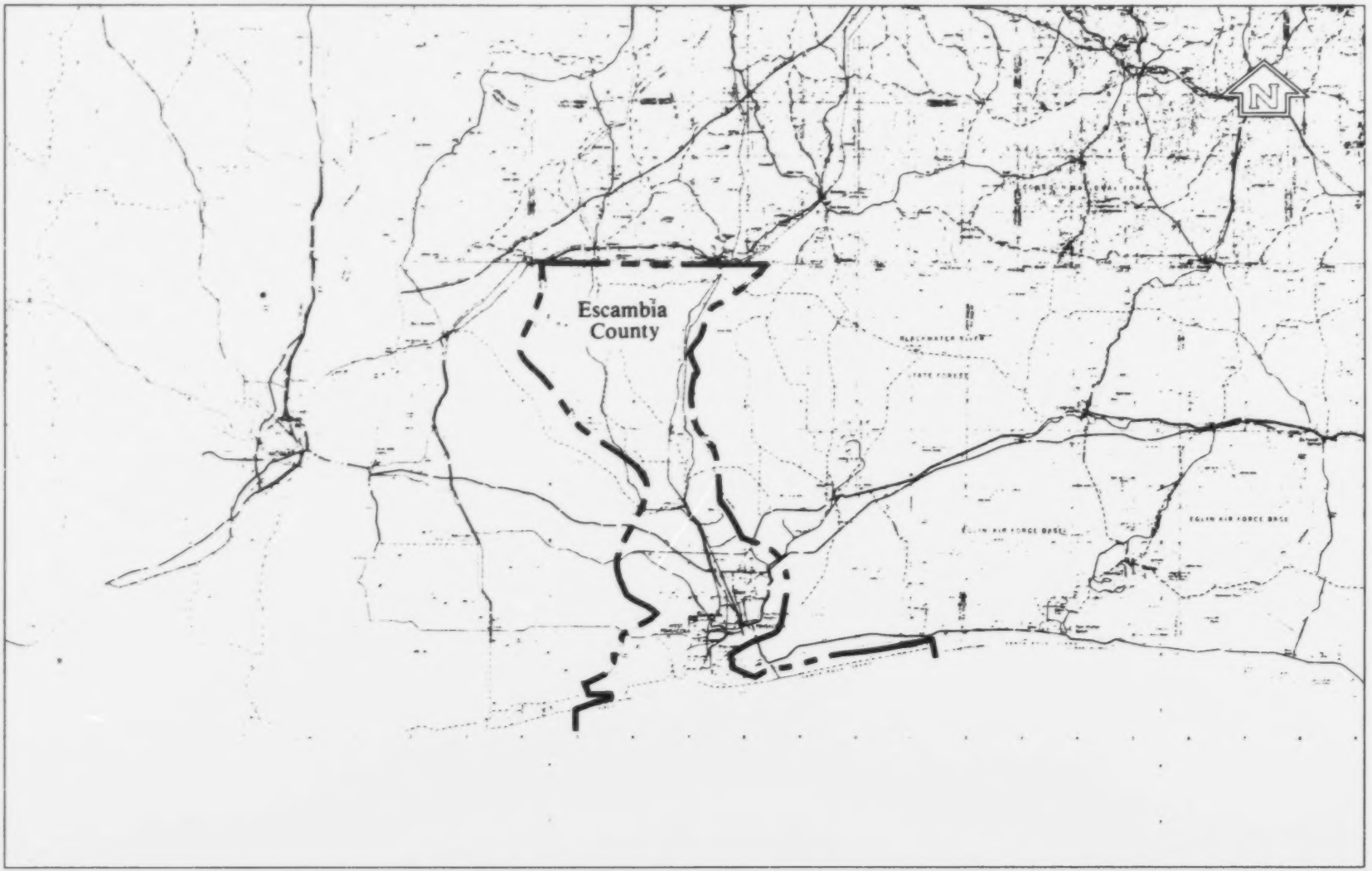


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

APPROXIMATE SCALE

16 0 16 32 48 MILES

VICINITY MAP

BEST COPY AVAILABLE

The main highways serving the area are Interstate 10, U.S. Routes 90, 98, and 29, and State Roads 97, 95, 10, 292, and 30. The Louisville & Nashville Railroad and the Burlington Northern railroad pass through the community.

The 1980 population of Escambia County was reported to be 233,794. The City of Pensacola, the largest city and the county seat, had a population of 57,619, according to the 1980 census (Reference 1). Pensacola Beach-Santa Rosa Island Authority had a population of 3,000 in 1984 (Reference 2).

Industry in the county is located in the greater Pensacola area and consists of a U.S. Navy repair and service facility, a nylon fibers manufacturing company, a chemical plant, and a manufacturer of components for atomic generators. Outside the Pensacola urban center, beef, poultry products, and field and garden crops are produced.

The terrain of Escambia County varies. Santa Rosa Island and Perdido Key, together stretching nearly 40 miles along the Gulf of Mexico, consist of wide sand dunes with scattered clumps of trees and bushes. The area south of the City of Pensacola from Pensacola Bay to Perdido Bay is generally flat with large pockets of poorly-drained soil. North of Pensacola and inland from the streams, the terrain is characterized by rolling forested hills with elevations reaching nearly 300 feet (Reference 3).

The climate of Escambia County is subtropical, with a moderating influence from the Gulf of Mexico. The normal average daily temperature varies from 55 degrees Fahrenheit (F.) in January to 82 degrees F. in August. The average annual precipitation is 57.6 inches (Reference 3).

The main drainage systems of the county, the Perdido and Escambia Rivers, are characterized by low swampy areas that are most extensive at the stream mouths. Flood plains across these rivers reach as far as 4 miles.

Pensacola Beach-Santa Rosa Island Authority, is a beachfront community located on Santa Rosa Island in the southeastern portion of the county. It shares beachfront with the Gulf of Mexico, Santa Rosa Sound, and Little Sabine Bay.

Industry in the area is largely tourist related. Tourists enjoy an abundance of salt water fishing along with swimming, sailing, and other water sports. The Intracoastal Waterway located in Santa Rosa Sound, is also important to the community.

Being located on a barrier island, Pensacola Beach-Santa Rosa Island Authority terrain consists of shifting sand dunes and miles of sandy white beaches.

The City of Pensacola is located in southern Escambia County. It borders Escambia and Pensacola Bays on the east and unincorporated areas of Escambia County on the west.

2.3 Principal Flood Problems

Flood problems in the county can be attributed to riverine flooding and tidal surge. Riverine flooding occurs as a result of both naturally occurring storm patterns and severe precipitation due to hurricanes.

BEST COPY AVAILABLE

Some of the worst floods to occur in northwestern Florida were the result of high intensity rainfall during hurricanes. The time of concentration of runoff for large basin rivers in northwestern Florida may be several days; consequently, peak flows do not, as a rule, coincide with hurricane tides at the coast. The smaller streams, however, have a shorter time of concentration and the floodflow occurring concurrently with the storm surge is more likely. This greatly increases the likelihood of inundation of low lying areas along the coast. The maximum rainfall ordinarily occurs in the eastern half of the storm system. As the storm passes inland, its intensity decreases, but heavy rainfall continues. Total precipitation of 12 inches recorded at a single station during a hurricane is not uncommon, and in northwestern Florida, rainfall has been as high as 24 inches for the duration of the storm (Reference 4).

Normal rainfall patterns are greatest during two distinct periods: 1) during summer, due to afternoon and evening thunderstorms, and 2) during late winter and early spring due to frontal systems.

The Escambia River is the major river in the county and accounts for much of the flooding in the area. The river is characterized by wide, flat flood plains varying from several thousand feet to several miles wide. The flat slopes and wide, heavily vegetated flood plains enhance the flood problem by preventing the rapid drainage of floodwaters. At flood stage, it covers large areas, flooding farm land, fishing resorts, and other businesses built on the flood plain.

Major storms to date include the 1929 storm and the 1975 storm. The 1929 storm was the largest storm ever recorded. At the gaging station near Century, Florida, the Escambia River reached an elevation of 66.14 feet National Geodetic Vertical Datum of 1929 (NGVD), 13.48 feet higher than the next largest storm. Although this gaging station is not in the immediate study area, flows recorded there are representative of the magnitude experienced within the study area. The 1975 storm was the second largest storm recorded; it reached an elevation of 51.66 feet NGVD near Century. The recurrence interval of this 1975 storm is once every 12 years while the 1929 storm interval would be less than once in 500 years.

Other streams in the study that are part of the Escambia basin include Pine Barren Creek and Thompson Bayou. Pine Barren Creek is located in what is called the Interior Uplands and flows primarily through relatively undeveloped land used for agriculture and forestry. It is distinguished from the Coastal Lowlands by a line more or less parallel to the coast at approximately the 100-foot contour. The only known flood problem in these watersheds is that of erosion. However, this flood problem is agriculture and forest related and can be controlled by revegetation. A gaging station is located on Pine Barren Creek near Barth, Florida. This station has data from the last 29 years with the largest storm occurring in 1955, two years after installation. This storm produced a flow rate of 24,800 cubic feet per second (cfs) and a stage of 47.86 feet NGVD. The return period of such a storm is once every 44 years.

Thompson Bayou is located in the Coastal Lowlands just northeast of Pensacola. It runs through the Scenic Hills subdivision and just west of the University of West Florida. Even though no severe flooding problems have

BEST COPY AVAILABLE

been recorded, Thompson Bayou poses a threat to residential housing in the area and also to future development along the stream.

Flood problems on Elevenmile Creek are minimal, restricted primarily to erosion problems in the upstream areas. Elevenmile Creek runs just west of Pensacola, flowing south to Perdido Bay. Because development is not intense along the stream, there is only minimal flooding in residential areas.

The coastal areas of Escambia County are subject to flooding from tidal surges associated with hurricanes. The terrain inland from Pensacola, Escambia, and Perdido Bays generally rises at a moderate rate and flooding from surges extends only a short distance inland. The elevation of Santa Rosa Island, a barrier island, will permit overtopping from some storms and, thus, does not provide complete protection to inland areas behind the island.

Escambia County has experienced flooding from several hurricanes since 1871. Among the most severe hurricanes were those of 1906, 1917, and 1926. In 1906, high tides of 10 feet NGVD were reported at Pensacola and 10.8 feet NGVD at Ft. Barrancas. In the storm of 1917, a high tide of 7.8 feet NGVD was reported at Ft. Barrancas and in the 1926 storm, a high tide of 9.4 feet NGVD was observed at the Pensacola waterfront. This compares with the GKY 100-year surge prediction of 3 to 6 feet NGVD (Reference 5). The prediction does not incorporate the effects of wind driven waves or the tidal influences of the heavenly bodies.

2.4 Flood Protection Measures

There is no extensive construction for flood protection. A few individuals have built private bulkheads, and some of the new homes are being built with a high first floor elevation.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

BEST COPY AVAILABLE

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community. Analyses were also carried out to establish the peak elevation-frequency relationships for each coastal flooding source studied in detail.

Three methods were used to determine the discharges used on the streams studied. Pine Barren Creek historical data were fitted to a log-Pearson Type III distribution to obtain the desired discharge-frequency relationships. In this analysis, the methods established by the U.S. Water Resources Council Bulletin No. 17A (Reference 6) were followed utilizing data provided by the Tallahassee Subdistrict of the U.S. Geological Survey (USGS). The gage on Pine Barren Creek had 25 years of data. For all other streams, regional analyses were performed using the procedures in USGS Water Supply Paper No. 1674 (Reference 7).

To determine the accuracy of the data and curves in WSP 1674, various frequency flows at gaged sites were estimated by regional analysis and compared to the log-Pearson Type III distributions obtained from the data at the gages. The log-Pearson Type III distributions were consistently steeper than the regionally determined distributions and always provided the better fit to the actual measured data. Variations in the estimated flows by the two methods often exceeded 100 percent, particularly at the higher recurrence intervals.

To minimize the disparity between the regionally determined and log-Pearson Type III flows, it was necessary to modify the regional curves on a hydrologic subunit basis to reflect more accurately flood frequency conditions. The regional analysis methodology of WSP 1674 was developed utilizing a log-normal distribution for data through 1961. The initial modifications to the regional analysis were to include all data through the 1977 Water Year and to reconstruct the regional curves in WSP 1674 using log-Pearson Type III distributions rather than log-normal distributions. This was done by replotting the Mean Annual Flow (Q_m) vs. Drainage Area relationship, taking Q_m from the log-Pearson Type III curves at each gage. The ratio of Peak Flow (Q_p/Q_m) vs. Recurrence Interval was also replotted using log-Pearson Type III values. By incorporating skew into the regional analysis, the regionally determined distributions were made similar to the log-Pearson Type III distributions at the gages. The differences in the estimated flows at the gages by the two methods were also smaller, reflecting the fact that the flows were determined by similar distributions and that the regional analysis included an additional 16 years of record at many stations.

To further reduce the discrepancies in flows and to bring the regionally determined flows within the expected sampling error at the gages, an adjustment factor was applied to the Mean Annual Flow used in the regional analysis. This adjustment was determined in the following manner. For each gaged site in a hydrologic region, flows from the 2-, 10-, 25-, 50-, 100-, and 500-year return period floods determined by a log-Pearson Type III analysis were divided by the regional Q_p/Q_m ratios to give values that represent what Q_m should have been for the regional analysis to duplicate

BEST COPY AVAILABLE

exactly the log-Pearson Type III values at a gage. The six values so obtained were averaged to give a single value, Q_m', for the station. Plotting Q_m' against Q_m yielded three straight lines, each representing a different hydrologically similar region. The slope of these curves provided a single adjustment factor for each region, applicable to Q_m determined from the Q_m vs. Drainage Area relationship. This procedure required only one initial correction for streams in a hydrologic subunit and yielded regionally determined flows that approximate those determined by a log-Pearson Type III analysis. Over the range of return periods of interest to this study, the regionally estimated flows fall within the 50 percent confidence interval defined by the confidence limits applicable to the log-Pearson Type III distributions at the gages.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each riverine flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
PINE BARREN CREEK					
just downstream of the Louisville & Nashville Railroad	75.3	10,494	26,141	36,462	72,738
THOMPSON BAYOU					
at mouth	7.5	703	1,370	1,762	2,998
ELEVENMILE CREEK					
just upstream of the confluence of Hurst Branch	47	5,498	11,645	15,414	27,880
just upstream of the confluence of Eightmile Creek	29	4,161	8,813	11,665	21,100
ESCAMBIA RIVER					
just upstream of U.S. Route 90	4,084	83,665	163,110	209,605	356,680
just upstream of the confluence of Pine Barren Creek	3,817	83,466	162,720	209,105	355,830

Inundation from the Gulf of Mexico, Escambia Bay, Santa Rosa Sound, Pensacola Bay, and Perdido Bay caused by passage of storms (storm surge) was determined by the joint probability method (Reference 8). The storm populations were described by probability distributions of 5 parameters that influence surge heights. These were central pressure depression (which measures the intensity of the storm), radius to maximum winds, forward speed of the storm, shoreline crossing point, and crossing angle. These characteristics were described statistically based on an analysis of observed

BEST COPY AVAILABLE

storms in the vicinity of Escambia County. Primary sources of data for this were obtained from "Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States" (Reference 9) and "Meteorological Considerations Pertinent to Standard Project Hurricane, Atlantic and Gulf Coasts of the United States" (Reference 10), by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). A summary of the parameters used for the area is presented in Table 2, Parameter Values for Surge Elevations.

For areas subject to flooding directly from the Gulf of Mexico, Escambia Bay, Santa Rosa Sound, Pensacola Bay, and Perdido Bay, the FEMA standard storm surge model was used to simulate the coastal surge generated by any chosen storm (that is, any combination of the 5 storm parameters defined previously). By performing such simulations for a large number of storms, each of known total probability, the frequency distribution of surge height can be established as a function of coastal location. These distributions incorporate the large-scale surge behavior, but do not include an analysis of the added effects associated with much finer scale wave phenomena, such as wave height or runup. As the final step in the calculations, the astronomic tide for the region is then statistically combined with the computed storm surge to yield recurrence intervals of total water level (Reference 11).

Wave setup was determined to significantly contribute to the total stillwater flood levels along the Atlantic Ocean coastline along Santa Rosa Island. The amount of wave setup was calculated using the methodology outlined in the U.S. Army Corps of Engineers (COE) "Shore Protection Manual" (Reference 12). The stillwater elevations for Transects 1 to 17 presented in Table 3, Summary of Stillwater Elevations, include wave set up.

The storm-surge elevations for the 10-, 50-, 100-, and 500-year floods have been determined for the Gulf of Mexico, Escambia Bay, Santa Rosa Sound, Pensacola Bay, and Perdido Bay and are shown in Table 3, Summary of Stillwater Elevations. The analyses reported herein reflect the stillwater elevations due to tidal and wind setup effects, and include the contributions from wave action effects.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the riverine sources studied were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals.

Cross sections, dams, and culverts for the backwater analysis of the streams studied in detail were obtained by field survey. The surveys were tied into USGS benchmarks so that all elevations would be referenced to the NGVD. Cross-section and bridge data for Pine Barren Creek were taken from a previous study (Reference 13).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Boundary and Floodway Map.

BEST COPY AVAILABLE

CENTRAL PRESSURE DEPRESSION (MILLIBARS)	15.2	24.2	33.2	38.2	49.2	60.2	75.2	79.2
ASSIGNED PROBABILITIES	0.32	0.27	0.06	0.11	0.09	0.08	0.05	0.02
STORM RADIUS TO MAXIMUM WINDS (NAUTICAL MILES)	12			24			36	
PROBABILITY	0.23			0.50			0.27	
FORWARD SPEED (KNOTS)	7			13			19	
PROBABILITIES: ENTERING	0.46			0.36			0.18	
DIRECTION OF STORM PATH (DEGREES FROM TRUE NORTH)		138	ENTERING	167		196		225
PROBABILITY		0.25		0.23		0.27		0.25
FREQUENCY OF STORM OCCURENCE (STORM/NAUTICAL MILE/YEAR)	0.002213							

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

PARAMETER VALUES FOR SURGE ELEVATIONS

BEST COPY AVAILABLE

FLOODING SOURCE AND LOCATION	TRANSECT	STILLWATER ELEVATION (FEET NGVD)			
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)
GULF OF MEXICO					
Along Perdido Key shoreline in the vicinity of the Florida-Alabama State boundary	1,2,3	3.1	N/A	9.9[1]	N/A
Along Perdido Key shoreline in the vincinity of Gulf Beach	4	3.6	N/A	10.3[1]	N/A
On Perdido Key just west of State Route 292	N/A	2.5	N/A	5.8	7.6
Along shoreline of western end of Big Lagoon	N/A	2.8	N/A	6.5	8.5
Within Big Lagoon along the northern shoreline of Perdido Key in the vicinity of Langley Point	N/A	3.6	6.8	8.0	9.9
Along Perdido Key shoreline near Langley Point east to Perdido Bay Inlet	5,6	3.8	N/A	10.9[1]	N/A
Just west of Perdido Bay Inlet	7	3.7	N/A	10.6[1]	N/A
Along shoreline of Santa Rosa Island just east of Pensacola Bay Inlet	8,9	3.5	N/A	10.5[1]	N/A
Along shoreline of Santa Rosa Island just west of Pensacola Beach	10	3.3	N/A	9.7[1]	N/A

[1]INCLUDES THE EFFECTS OF WAVE SETUP

BEST COPY AVAILABLE

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

SUMMARY OF STILLWATER ELEVATIONS

GULF OF MEXICO

FLOODING SOURCE AND LOCATION	TRANSECT	STILLWATER ELEVATION (FEET NGVD)			
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)
GULF OF MEXICO					
Along shoreline in the vicinity of Pensacola Beach	11	3.2	N/A	9.5[1]	N/A
Along shoreline of Santa Rosa Island in the vicinity of Sharp Point	12	3.1	N/A	9.2[1]	N/A
Along shoreline of Santa Rosa Island in the vicinity of Range Point	13	3.0	N/A	8.7[1]	N/A
Along shoreline of Santa Rosa Island in the vicinity of Big Sabine Point	14	2.8	N/A	8.3[1]	N/A
Along shoreline of Santa Rosa Island in the vicinity of the Escambia-Santa Rosa county boundary	15,16	2.6	N/A	7.9[1]	N/A
Along shoreline of Santa Rosa Island in the vicinity of Santa Rosa county boundaries	17	2.3	N/A	7.5[1]	N/A
PENSACOLA BAY					
Along shoreline in the vicinity of San Carlos	35	2.9	5.4	6.2	7.7
In the vicinity of the Pensacola Naval Air Station	18,19	2.8	5.2	6.1	7.5

[1]INCLUDES THE EFFECTS OF WAVE SETUP

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

SUMMARY OF STILLWATER ELEVATIONS

GULF OF MEXICO—PENSACOLA BAY

BEST COPY AVAILABLE

FLOODING SOURCE AND LOCATION	TRANSECT	STILLWATER ELEVATION (FEET NGVD)			
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)
PENSACOLA BAY					
Just east of Pensacola Bay Inlet along the northern shoreline of Santa Rosa Island	N/A	2.8	N/A	6.1	8.0
Along the northern shoreline of Santa Rosa Island about 2.0 miles east of Pensacola Bay Inlet	N/A	2.8	5.1	5.9	7.3
Along shoreline in the vicinity of Warrington	20	3.1	5.6	6.6	8.2
Along shoreline from Bayou Chico to the Pensacola Bay Bridge	21,22	2.9	5.4	6.2	7.7
Along shorelines of Texar Bayou	N/A	2.8	5.0	5.9	7.3
ESCAMBIA BAY					
Along shoreline in the vicinity of Gaberonne	24	3.0	5.5	6.5	7.9
Along shoreline in the vicinity of East Pensacola Heights	23	2.8	5.0	5.9	7.3
Along shoreline just north of Gull Point	N/A	3.2	6.0	7.2	8.7
Along shoreline between Lora Point and Gull Point	37	3.3	6.2	7.2	9.0

BEST COPY AVAILABLE

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

SUMMARY OF STILLWATER ELEVATIONS

PENSACOLA BAY—ESCAMBIA BAY

FLOODING SOURCE AND LOCATION	TRANSECT	STILLWATER ELEVATION (FEET NGVD)			
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)
ESCAMBIA BAY					
In the vicinity of Lora Point	N/A	3.5	6.6	7.7	9.6
Along shoreline just south of the Escambia River mouth	25	3.8	7.0	8.1	10.2
Along shoreline just north of the Escambia River mouth	34	3.9	7.3	8.4	10.6
Just west of Highway 90 along the Escambia River	N/A	3.8	7.0	8.2	10.2
PERDIDO BAY					
Along northern shoreline of Perdido Key in the vicinity of Rabbit Island	N/A	2.6	N/A	6.1	8.0
On Perdido Key in the vicinity of Holiday Harbor Marina	N/A	2.2	N/A	5.2	6.8
Along northern shoreline of Intracoastal Waterway from Gulf Beach Heights to Inerarity Point	N/A	1.9	N/A	4.5	5.9
From Inerarity Point to just northeast of Bayou Garcon	N/A	1.9	N/A	4.4	5.7
Along shoreline from Du Pont Point to Tarkiln Bayou	26,27	1.8	N/A	4.3	5.5

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

SUMMARY OF STILLWATER ELEVATIONS

ESCAMBIA BAY—PERDIDO BAY

BEST COPY AVAILABLE

FLOODING SOURCE AND LOCATION	TRANSECT	STILLWATER ELEVATION (FEET NGVD)			
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)
PERDIDO BAY					
Along shoreline from Du Pont Point to Nix Point	28	2.0	N/A	4.6	6.1
Along shoreline in the vicinity of Perdido Heights	29	2.2	N/A	5.1	6.8
In the vicinity of Paradise Beach	N/A	2.3	N/A	5.3	6.9
Along shoreline just south of Double Point	N/A	2.4	N/A	5.6	7.3
Along shoreline in the vicinity of Double Point	30	2.3	N/A	5.6	7.2
Along shoreline in the vicinity of Millview	31	2.7	N/A	6.4	8.4
Just south of Perdido River mouth near Grassy Point in Baldwin County Alabama	36	2.6	N/A	6.1	8.0
Along shoreline in the vicinity of the mouth of the Perdido River	33	2.9	N/A	6.7	8.6
Along shoreline in the vicinity of Ramsey Beach	32	2.8	N/A	6.6	8.6

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

SUMMARY OF STILLWATER ELEVATIONS

PERDIDO BAY

BEST COPY AVAILABLE

FLOODING SOURCE AND LOCATION	TRANSECT	STILLWATER ELEVATION (FEET NGVD)			
		10% (10-YEAR)	2% (50-YEAR)	1% (100-YEAR)	0.2% (500-YEAR)
SANTA ROSA SOUND					
Along the northern shoreline of Santa Rosa Island from Pensacola Beach to just west of the Navarre Toll Bridge	N/A	2.8	5.1	5.9	7.4
Along the northern shoreline of Santa Rosa Island in the vicinity of the Navarre Toll Bridge	N/A	2.8	5.3	6.1	7.6

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

SUMMARY OF STILLWATER ELEVATIONS

SANTA ROSA SOUND

BEST COPY AVAILABLE

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and flood plain areas. Channel roughness values in the study range from 0.035 to 0.04 with 0.18 used as the flood plain value.

Water-surface elevations of floods of the selected recurrence intervals were computed through use of the COE HEC-2 backwater computer program (Reference 14). Starting water-surface elevations for main stem streams were calculated using the slope-area method. Starting elevations for tributary streams were developed by the coincident peak method. Computed water-surface elevations were used to construct profiles for floods of the selected recurrence intervals. The acceptability of the hydraulic input data was checked using engineering judgment.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals. In cases where the 50- and 100-year flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been drawn.

The hydraulic analyses for the riverine study are based only on the effects of unobstructed flow. The flood elevations shown on the profiles are, thus, considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Hydraulic analyses, considering storm characteristics and the shoreline and bathymetric characteristics of the flooding sources studied, were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the shorelines.

The FEMA storm surge model was utilized to simulate the hydrodynamic behavior of the surge generated by the various synthetic storms. This model utilizes a grid pattern approximating the geographical features of the study area and the adjoining areas. Surges were computed utilizing grids of 5 statute miles and 1 statute mile, depending on the resolution required.

Underwater depths and land heights for the model grid systems were obtained from topographic mapping at a scale of 1:24000 with a contour interval of 5 or 10 feet (References 15 and 16).

The methodology for analyzing the effects of wave heights associated with coastal storm surge flooding is described in a report prepared by the National Academy of Sciences (Reference 17). This method is based on the following major concepts. First, depth-limited waves in shallow water reach a maximum breaking height that is equal to 0.78 times the stillwater depth. The wave crest is 70 percent of the total wave height above the stillwater level. The second major concept is that wave height may be diminished by dissipation of energy due to the presence of obstructions, such as sand dunes, dikes and seawalls, buildings, and vegetation. The amount of energy dissipation is a function of the physical characteristics of the obstruction and is determined by procedures prescribed in Reference 16. The third major concept is that wave height can be regenerated in open fetch areas due to the transfer of wind energy to the water. This added energy is related to fetch length and depth.

BEST COPY AVAILABLE

Wave heights were computed along transects (cross-section lines) that were located along the coastal areas, as illustrated in Figure 2, Transect Location Map, in accordance with the "Users Manual for Wave Height Analysis" (Reference 18). The transects were located with consideration given to the physical and cultural characteristics of the land so that they would closely represent conditions in their locality. Transects were spaced close together in areas of complex topography and dense development. In areas having more uniform characteristics, they were spaced at large intervals. It was also necessary to locate transects in areas where unique flooding existed and in areas where computed wave heights varied significantly between adjacent transects.

Each transect was taken perpendicular to the shoreline and extended inland to a point where wave action ceased. Along each transect, wave heights and elevations were computed considering the combined effects of changes in ground elevation, vegetation, and physical features. The stillwater elevations for the 100-year flood were used as the starting elevations for these computations. Wave heights were calculated to the nearest 0.1 foot, and wave elevations were determined at whole-foot increments along the transects. The location of the 3-foot breaking wave for determining the terminus of the V zone (area with velocity wave action) was also computed at each transect. Table 4 provides a listing of the transect locations and stillwater starting elevations, as well as initial wave crest elevations.

Dune erosion was taken into account along the Gulf Coast shoreline of Santa Rosa Island. The amount of dune erosion was calculated using the methodology outlined by Hill and Herchenroder (Reference 19).

Figure 3 represents a sample transect that illustrates the relationship between the stillwater elevation, the wave crest elevation, the ground elevation profile, and the location of the A/V zone boundary.

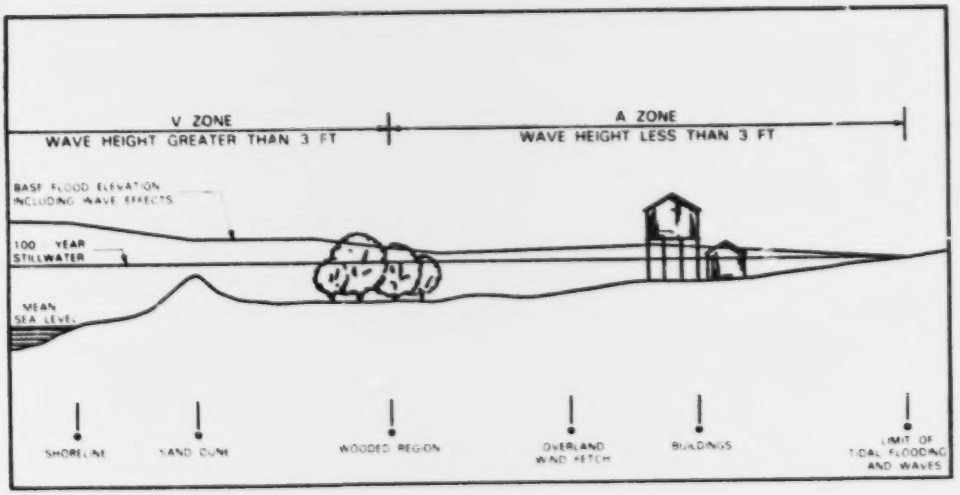
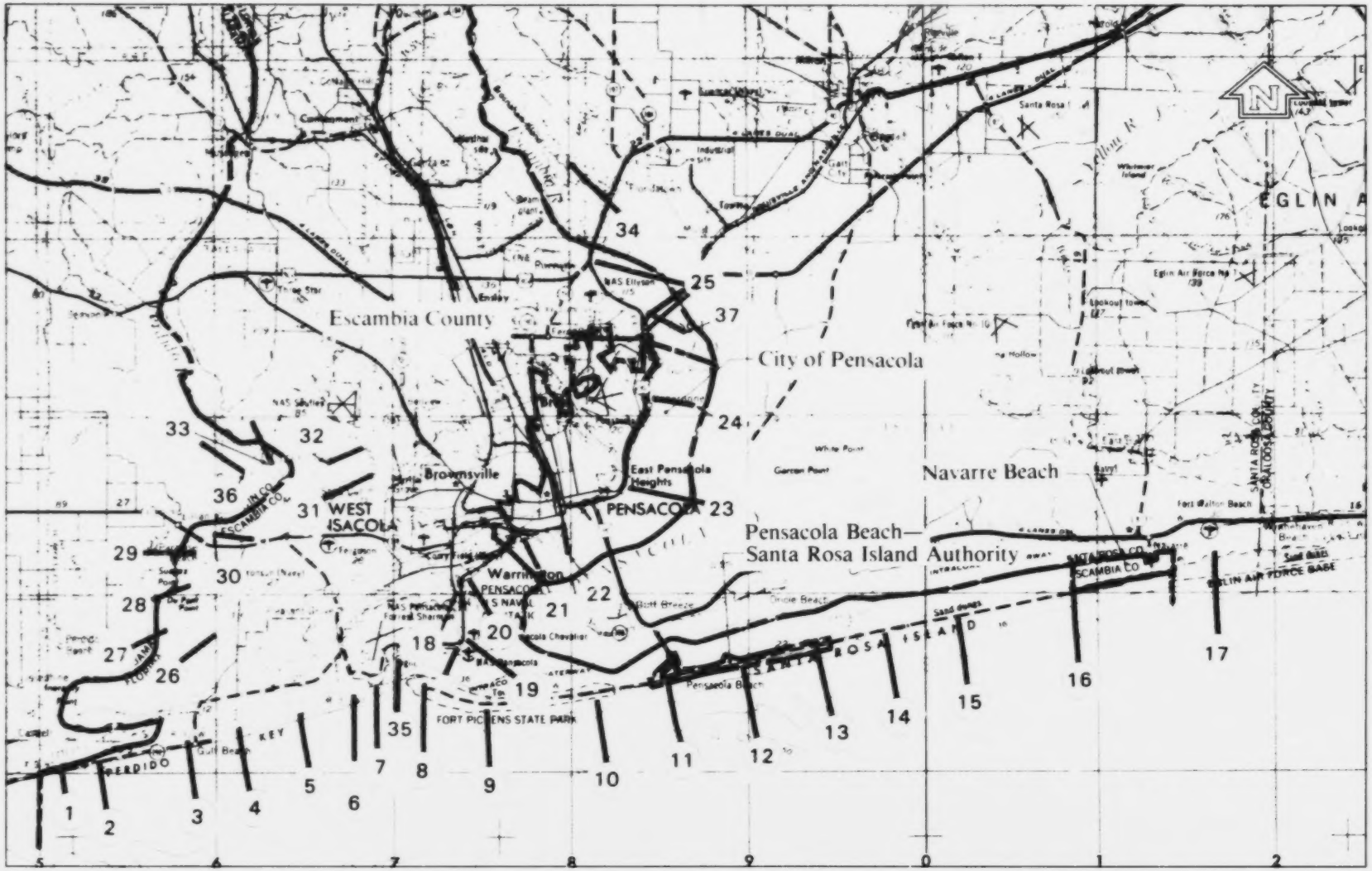


FIGURE 3 - Transect Schematic

BEST COPY AVAILABLE



FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

APPROXIMATE SCALE

5 0 5 10 15 MILES

TRANSECT LOCATION MAP

FIGURE 2

BEST COPY AVAILABLE

LE 4 - TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS

Transect	Location	Elevation (Feet) Stillwater	Wave Crest
1	Located about 2,800 feet east of the Baldwin-Escambia county boundary on Perdido Key at the Gulf of Mexico.	9.9*	15.3
2	Located about 2.1 miles east of the Baldwin-Escambia county boundary on Perdido Key at the Gulf of Mexico.	9.7*	15.0
3	Located about 5.2 miles east of the Baldwin-Escambia county boundary on Perdido Key at the Gulf of Mexico.	9.8*	15.2
4	Located about 6.9 miles east of the Baldwin-Escambia county boundary on Perdido Key at the Gulf of Mexico.	10.3*	15.9
5	Located about 3.2 miles west of Pensacola Bay Inlet on Perdido Key at the Gulf of Mexico.	10.9*	16.9
6	Located about 1.0 mile west of Pensacola Bay Inlet on Perdido Key at the Gulf of Mexico.	10.9*	16.9
7	Located about 1,000 feet west of the Pensacola Bay Inlet on Perdido Key at the Gulf of Mexico.	10.6*	16.4
8	Located about 1,000 feet east of Pensacola Bay Inlet on Santa Rosa Island at the Gulf of Mexico.	10.5*	16.3
9	Located about 3.4 miles east of Pensacola Bay Inlet on Santa Rosa Island at the Gulf of Mexico.	10.1*	15.6
10	Located about 2.5 miles west of Pensacola Beach on Santa Rosa Island at the Gulf of Mexico.	9.7*	15.0

BEST COPY AVAILABLE

TABLE 4 - TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS (Continued)

Transect	Location	Elevation (Feet) Stillwater	Wave Crest
11	Located about 1.0 mile west of Pensacola Beach on Santa Rosa Island at the Gulf of Mexico.	9.5*	14.7
12	Located about 2.0 miles east of Pensacola Beach on Santa Rosa Island at the Gulf of Mexico.	9.2*	14.3
13	Located about 4.8 miles east of Pensacola Beach on Santa Rosa Island at the Gulf of Mexico.	8.7*	13.4
14	Located about 9.7 miles west of the Escambia-Santa Rosa county line on Santa Rosa Island at the Gulf of Mexico.	8.3*	12.9
15	Located about 7.1 miles west of the Escambia-Santa Rosa county line on Santa Rosa Island at the Gulf of Mexico.	7.9*	12.2
16	Located about 3.1 miles west of the Escambia-Santa Rosa county line on Santa Rosa Island at the Gulf of Mexico.	7.6*	11.8
17	Located about 2.0 miles east of the Escambia-Santa Rosa county line on Santa Rosa Island at the Gulf of Mexico.	7.5*	11.6
18	Located along the southern shoreline of the Pensacola Naval Air Station just south of Chevalier Field at Pensacola Bay.	6.1	8.8
19	Located along the eastern shoreline of the Pensacola Naval Air Station about 1.5 miles south of Magazine Point at Pensacola Bay.	6.0	8.7
20	Located along the southeastern shoreline of Warrington near Star Lake at Pensacola Bay.	6.6	9.5

*includes the effects of wave setup

BEST COPY AVAILABLE

TABLE 4 - TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS (Continued)

Transect	Location	Elevation (Feet) Stillwater	Wave Crest
21	Located along the southern shoreline of Pensacola at Sanders Beach at Pensacola Bay.	6.2	8.9
22	Located along the southern shoreline of Pensacola about 1.2 miles east of Sanders Beach at Pensacola Bay.	6.2	8.9
23	Located along the eastern shoreline of Pensacola about 2,500 feet northeast of Emanuel Point at Escambia Bay.	5.9	8.5
24	Located about 3,000 feet north of the Town of Gaberonne at Escambia Bay.	6.5	9.4
25	Located about 2.3 miles northwest of Lora Point at Escambia Bay.	8.1	11.8
26	Located within Tarkiln Bay about 3,600 feet east of Tarkiln Point at Perdido Bay.	4.3	6.6
27	Located about 3,400 feet northwest of Tarkiln Point at Perdido Bay.	4.2	6.5
28	Located about 4,900 feet southeast of Nix Point at Perdido Bay.	4.6	7.1
29	Located at Perdido Heights just south of Cummings Point at Perdido Bay.	5.1	7.9
30	Located at Double Point at Perdido Bay.	5.6	8.7
31	Located at Perdido Bay about 1.2 miles northeast of Millview.	6.4	9.8

BEST COPY AVAILABLE

TABLE 4 - TRANSECT LOCATIONS, STILLWATER STARTING ELEVATIONS, AND INITIAL WAVE CREST ELEVATIONS (Continued)

Transect	Location	Elevation (Feet) Stillwater	Wave Crest
32	Located just south of Ramsey Beach at Perdido Bay.	6.6	10.2
33	Located about 4,000 feet west of Chambers Point at Perdido Bay.	6.7	10.3
34	Located at the mouth of the Bannahassee River at Escambia Bay.	8.7	12.5
35	Located in the vicinity of San Carlos Beach just north of Pensacola Bay Inlet.	6.2	9.6
36	Located about 1.5 miles south of the mouth of the Perdido River at Perdido Bay.	6.1	8.0
37	Located just south of Lola Point at Escambia Bay.	7.2	11.2

BEST COPY AVAILABLE

23

After analyzing wave heights along each transect, wave elevations were interpolated between transects. Various source data were used in the interpolation, including topographic maps (References 15 and 16), aerial photographs (Reference 20), and engineering judgment. Controlling features affecting the elevations were identified and considered in relation to their positions at a particular transect and their variation between transects.

In addition to the wave height analysis, wave runup was examined along the Atlantic Ocean coastline of Santa Rosa Island. Wave runup was computed using the methodology presented in the COE "Shore Protection Manual" (Reference 12). The areas of Santa Rosa Island that were affected by wave runup were designed as shallow flooding areas with a depth of 1 foot.

All elevations are referenced to the NGVD. Elevation reference marks used in this study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study produces flood boundary maps designed to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 5 or 10 feet (References 15 and 16). For each coastal flooding source studied in detail, the 100- and 500-year flood boundaries have been delineated using the flood elevations determined at each transect. Between transects, the boundaries were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 10 feet (Reference 16).

For the streams studied by approximate methods, only the 100-year flood plain boundary was delineated using the previous Type 15 Flood Insurance Studies (References 21-23).

The 100- and 500-year flood plain boundaries are shown on the Flood Boundary and Floodway Map. In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

BEST COPY AVAILABLE

4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed and are presented in Table 5, Floodway Data.

As shown on the Flood Boundary and Floodway Map, the floodway boundaries were computed at cross sections. Between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown. Portions of the floodway of the Escambia River lie outside the county boundary.

The area between the floodway and the 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 4.

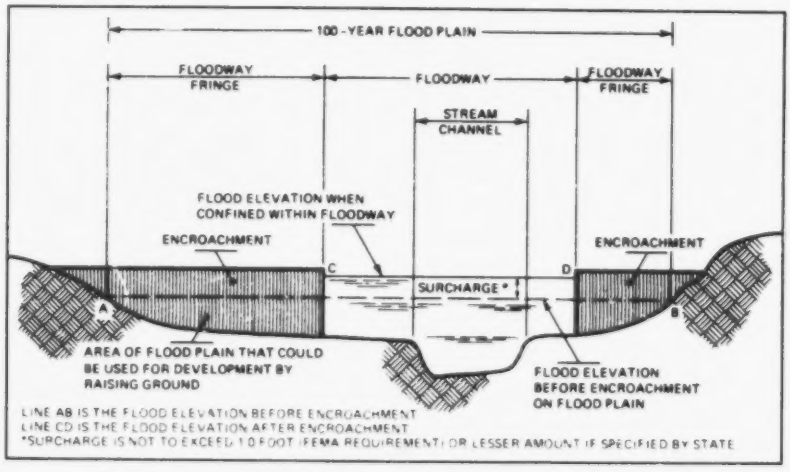

100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 4 - Floodway Schematic

BEST COPY AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
ESCAMBIA RIVER								
A	260	11,754	36,963	5.7	1.5	1.5[3]	2.4	0.9
B	9610	13,210	130,016	1.6	8.4	8.4[3]	8.7	0.3
C	14,210	11,092	138,573	1.5	10.8	10.8	11.3	0.5
D	23,510	8356	139,970	1.5	15.3	15.3	16.2	0.9
E	30,970	9500	179,667	1.2	18.1	18.1	19.0	0.9
F	39,920	10,890	191,767	1.1	20.3	20.3	21.1	0.8
G	50,110	12,510	244,300	0.9	22.4	22.4	23.3	0.9
H	56,790	9645	181,617	1.2	23.5	23.5	24.4	0.9
I	64,350	8944	167,420	1.3	25.2	25.2	26.0	0.8
J	66,210	9355	200,121	1.0	25.8	25.8	26.6	0.8
K	72,730	10,140	206,179	1.0	26.8	26.8	27.6	0.8
L	80,520	11,080	235,113	0.9	27.7	27.7	28.6	0.9
M	88,440	13,208	250,439	0.8	28.5	28.5	29.4	0.9
N	111,480	11,294	261,455	0.8	30.2	30.2	31.2	1.0
O	118,200	14,040	322,763	0.6	30.8	30.8	31.8	1.0
P	125,200	14,840	289,835	0.7	31.4	31.4	32.4	1.0
Q	134,200	12,062	217,520	1.0	32.1	32.1	33.1	1.0
R	143,320	7548	154,025	1.4	33.5	33.5	34.5	1.0

[1]FEET ABOVE U.S. ROUTE 90
[2]THIS WIDTH EXTENDS BEYOND COUNTY BOUNDARY
[3]ELEVATIONS WITHOUT CONSIDERING STORM SURGE EFFECT FROM ESCAMBIA BAY

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

FLOODWAY DATA

ESCAMBIA RIVER

BEST COPY AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
ELEVENMILE CREEK								
A	8000	1905	9010	1.7	6.7	6.7	7.7	1.0
B	13,200	655	6173	2.5	11.7	11.7	12.6	0.9
C	17,000	756	7780	2.0	14.1	14.1	15.0	0.9
D	20,200	1046	8721	1.3	15.5	15.5	16.4	0.9
E	22,200	1054	8255	1.4	17.1	17.1	18.0	0.9
F	24,200	512	5507	2.1	19.4	19.4	20.2	0.8
G	27,200	802	7191	1.6	23.6	23.6	24.5	0.9
THOMPSON BAYOU								
A	7400	150	476	3.7	9.0	4.6[2]	4.8	0.2
B	8150	150	751	2.3	9.0	6.8[2]	7.2	0.4
C	8875	120	443	4.0	9.0	7.3[2]	7.6	0.3
D	9725	103	327	5.4	9.4	9.4	9.4	0.0
E	11,650	28	179	9.8	19.9	19.9	20.1	0.2

[1]FEET ABOVE MOUTH
[2]ELEVATIONS WITHOUT CONSIDERING STORM SURGE EFFECT FROM ESCAMBIA BAY

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

FLOODWAY DATA

ELEVENMILE CREEK—THOMPSON BAYOU

BEST COPY AVAILABLE

The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

5.0 INSURANCE APPLICATION

To establish actuarial insurance rates, data from the engineering study must be transformed into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting Escambia County.

5.1 Reach Determinations

For riverine studies, reaches are defined as sections of flood plain that have relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference may not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the riverine flooding sources of Escambia County are shown on the Flood Profiles and summarized in Table 6, Flood Insurance Zone Data.

In coastal areas, reaches are limited to the distance for which the 100-year flood elevation does not vary more than 1.0 foot. The location of these reaches are shown on the Flood Insurance Rate Map.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to establish relationships between depth and frequency of flooding in any reach. This relationship is then used with depth-damage relationships for various classes of structures to establish actuarial insurance rate tables.

The FHF for a riverine reach is the average weighted difference between the 10- and 100-year flood water-surface elevations rounded to the nearest 0.5 foot, multiplied by 10, and shown as a 3-digit code.

The FHF for areas subject only to storm surge flooding is the difference between the 10- and 100-year stillwater elevations rounded to the nearest 0.5 foot, multiplied by 10, and shown as a 3-digit code. For areas with wave heights less than 3 feet, the FHF is the weighted average difference between the 100-year wave crest elevation and the 10-year stillwater elevation. For areas with wave heights greater than 3 feet, the FHF is determined using the difference between the 10- and 100-year stillwater

BEST COPY AVAILABLE

elevations multiplied by 1.55, then rounded to the nearest 0.5 foot, multiplied by 10, and shown as a 3-digit code.

For example, if the difference between elevations is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference is greater than 10.0 feet, it is rounded to the nearest whole foot.

5.3 Flood Insurance Zones

Flood insurance zones and zone numbers are assigned based on the type of flood hazard and the FHF, respectively. A unique zone number is associated with each possible FHF, and varies from 1 for a FHF of 005 to a maximum of 30 for a FHF of 200 or greater.

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.
Zones A4-A16:	Special Flood Hazard Areas inundated by the 100-year flood, with base flood elevations shown, and zones subdivided according to FHFs.
Zone A0:	Special Flood Hazard Areas inundated by types of 100-year shallow flooding where depths are between 1.0 and 3.0 feet; depths are shown, but no FHFs are determined.
Zones V8-V14, V16-V21:	Special Flood Hazard Areas along coasts inundated by the 100-year flood that have additional velocity hazards associated with waves of 3-foot amplitude or greater, with base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between Special Flood Hazard Areas and the limits of the 500-year flood; areas that are protected from the 100- or 500-year floods by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and, areas subject to 100-year flooding from sources with drainage areas of less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding; not subdivided.

BEST COPY AVAILABLE

Flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding sources studied in detail in the community are shown in Table 6, Flood Insurance Zone Data and Table 7, Coastal Flood Insurance Zone Data.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for Escambia County is, for insurance purposes, the principal product of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations. Base flood elevation lines for riverine flooding sources show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. For coastal flooding sources, the expected water-surface elevations of the base (100-year) flood are shown as a weighted average within zones. Each whole-foot elevation is delineated except where cartographic considerations require the combination of two or more elevation zones. The base flood elevations and zone numbers are used by insurance agents, in conjunction with structure elevations and characteristics, to assign actuarial insurance rates to structures and contents insured under the National Flood Insurance Program.

6.0 OTHER STUDIES

Due to its more detailed analysis this Flood Insurance Study supersedes the previously published Flood Insurance Studies for Escambia County, Pensacola Beach, and the City of Pensacola, Florida (References 21-23), and the previously printed Flood Insurance Rate Map for Navarre Beach, Florida (Reference 24).

A Type 19 Flood Insurance Study has been prepared for the Unincorporated Areas of Santa Rosa County, Florida (Reference 25) and is in agreement with this Flood Insurance Study.

Type 19 Flood Insurance Studies are currently being prepared for the Unincorporated Areas of Baldwin County, Alabama, and for the Town of Flomaton, Alabama (References 26 and 27) and both are in agreement with this Flood Insurance Study.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

BEST COPY AVAILABLE

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
ESCAMBIA RIVER							
REACH 1	0160,0170,0185, 0205,0215	−7.6	−2.4	6.0	075	A15	VARIES—SEE MAP
PINE BARREN CREEK							
REACH 1	0120,0125,0160	−7.1	−2.2	5.9	070	A14	VARIES—SEE MAP
ELEVENMILE CREEK							
REACH 1	0230	−3.7	−1.2	2.9	035	A7	VARIES—SEE MAP
THOMPSON BAYOU							
REACH 1	0215	−2.1	−0.7	1.7	020	A4	VARIES—SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

FLOOD INSURANCE ZONE DATA

ESCAMBIA RIVER—PINE BARREN CREEK—ELEVENMILE CREEK—THOMPSON BAYOU

BEST COPY AVAILABLE

FLOODING SOURCE	TRANSECT	PANEL[1]	ELEVATION DIFFERENCE[2,3] BETWEEN 1.0% (100-YEAR) FLOOD AND 10% (10-YEAR)	FLOOD HAZARD	ZONE	BASE FLOOD ELEVATION[2,4] (FEET NGVD)
GULF OF MEXICO	1	0290	−10.5	110	V21	12−15[5]
			−8.0	080	A16	10−12[6]
	2	0290,0295	−10.4	100	V20	12−15[5]
			−7.3	075	A15	10−12[6]
	3	0295	−10.3	100	V20	12−15[5]
			−7.3	075	A15	10−12[6]
	4	0285,0295,0305, 0315	−10.3	100	V20	12−16[5]
			−6.5	065	V13	9−10[6]
			−6.0	060	A12	9−12[6]
			−5.5	055	A11	7− 9[6]
	N/A	0285,0295	−3.3	035	A7	6
	N/A	0285	−3.7	035	A7	7
	N/A	0305,0315	−4.4	045	A9	8
	5	0305	−11.0	110	V21	13−17[5]
			−7.0	070	V14	11−12[6]
			−6.0	060	A12	8−13[6]
			−5.5	055	A11	8−11[6]
	6	0305	−11.3	110	V21	14−17[5]
			−10.0	100	V20	15[6]
			−7.0	070	V14	11−14[6]
			−5.5	055	A11	8−10[6]
	7	0305	−12.1	110	V21	13−16[5]
			−6.0	060	A12	8−10[6]

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE IN FEET
[3]ROUNDED TO NEAREST FOOT
[4]DUE TO MAP SCALE LIMITATIONS, BASE FLOOD ELEVATIONS SHOWN ON MAP MAP REPRESENT AVERAGE ELEVATIONS FOR THE ZONES DEPICTED
[5]INCLUDES EFFECTS OF WAVE ACTION
[6]INCLUDES EFFECTS OF WAVE SETUP

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

COASTAL FLOOD INSURANCE ZONE DATA

GULF OF MEXICO

BEST COPY AVAILABLE

FLOODING SOURCE	TRANSECT	PANEL[1]	ELEVATION DIFFERENCE[2,3] BETWEEN 1.0% (100 YEAR) FLOOD AND 10% (10 YEAR)	FLOOD HAZARD	ZONE	BASE FLOOD ELEVATION[3,4] (FEET NGVD)
GULF OF MEXICO	8	0310	−10.9 −8.0	110 080	V21 A16	13−16[5] 8−13[5]
	9	0310	−10.2 −5.0	100 050	V20 A10	12−16[5] 9−12[5]
	10	0310,0330	−9.9 −8.5	100 085	V20 A17	12−15[5] 9−12[5]
	11	0330	−9.8 −4.0	100 040	V20 A8	12−15[5] 6−12[5]
	12	0330,0335	−9.4 −6.5	095 065	V19 A13	11−14[5] 9−11[5]
	13	0335	−8.8 −6.5	090 065	V18 A13	11−13[5] 9−11[5]
	14	0335,0355	−8.5 −5.5	085 055	V17 A11	10−13[5] 8−10[5]
	15	0355	−8.2 −6.0	080 060	V16 A12	10−12[5] 8−10[5]
	16	0335,0360	−8.1 −5.5	080 055	V16 A11	10−12[5] 8−10[5]
	17	0360	−8.1 −5.5	080 055	V16 A11	10−12[5] 8−10[5]

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE IN FEET
[3]ROUNDED TO NEAREST FOOT
[4]DUE TO MAP SCALE LIMITATIONS, BASE FLOOD ELEVATIONS SHOWN ON MAP MAP REPRESENT AVERAGE ELEVATIONS FOR THE ZONES DEPICTED
[5]INCLUDES EFFECTS OF WAVE ACTION
[6]INCLUDES EFFECTS OF WAVE SETUP

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

COASTAL FLOOD INSURANCE ZONE DATA

GULF OF MEXICO

BEST COPY AVAILABLE

FLOODING SOURCE	TRANSECT	PANEL[1]	ELEVATION DIFFERENCE[2,5] BETWEEN 1.0% (100-YEAR) FLOOD AND 10% (10-YEAR)	FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3,4] (FEET NGVD)
PENSACOLA BAY	35	0305,0310	−5.1	050	V10	10
	18	0310	−5.1	050	V10	8– 9
			−3.5	035	A7	6– 8
	N/A	0310	−3.3	035	A7	6
	N/A	0310	−3.1	030	A6	6
	19	245,310	−5.1	050	V10	8– 9
			−3.5	035	A7	6– 8
	20	0245,0265,0305, 0310	−5.4	055	V11	9–10
			−3.5	035	A7	7– 8
	21	0265	−5.1	050	V10	8– 9
			−3.5	035	A7	6– 8
	22	0245,0265	−5.1	050	V10	8– 9
			−3.5	035	A7	6– 8
	N/A	0265,0255	−3.1	030	A6	6
ESCAMBIA BAY	24	0255,0260	−5.4	055	V11	9
			−3.5	035	A7	7– 9
	23	0255	−4.8	050	V10	8– 9
			−4.0	040	A8	6– 8
	N/A	0255,0260	−4.0	040	A8	7

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE IN FEET
[3]ROUNDED TO NEAREST FOOT
[4]DUE TO MAP SCALE LIMITATIONS, BASE FLOOD ELEVATIONS SHOWN ON MAP MAY REPRESENT AVERAGE ELEVATIONS FOR THE ZONES DEPICTED
[5]INCLUDES EFFECTS OF WAVE ACTION

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

COASTAL FLOOD INSURANCE ZONE DATA

PENSACOLA BAY—ESCAMBIA BAY

BEST COPY AVAILABLE

FLOODING SOURCE	TRANSECT	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND 10% (10-YEAR)	FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3,4] (FEET NGVD)
ESCAMBIA BAY	37	0255	−6.0[5] −4.5[5]	060 045	V12 A9	9−11 7− 9
	N/A	0215	−4.2	040	A8	8
	25	0215	−6.7[5] −5.0[5]	065 050	V13 A10	10−12 8−10
	34	0215	−7.0[5] −6.5[5]	070 065	V14 A13	12−13 10
	N/A	0215	−4.4	045	A9	9
PERDIDO BAY	N/A	0295	−3.5	035	A7	6
	N/A	0285,0295	−3.0	030	A6	5
	N/A	0280,0285	−2.6	025	A5	5
	N/A	0240,0285,0280	−2.5	025	A5	4
	26	0305	−3.8[5] −2.5[5]	040 025	V8 A5	6− 7 4− 6
	27	0285	−3.8 −3.0	040 030	V8 A6	6− 7 4− 6
	28	0240	−4.0 −2.5	040 025	V8 A5	7 5− 7

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE IN FEET
[3]ROUNDED TO NEAREST FOOT
[4]DUE TO MAP SCALE LIMITATIONS, BASE FLOOD ELEVATIONS SHOWN ON MAP MAY REPRESENT AVERAGE ELEVATIONS FOR THE ZONES DEPICTED
[5]INCLUDES EFFECTS OF WAVE ACTION

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

COASTAL FLOOD INSURANCE ZONE DATA

ESCAMBIA BAY—PERDIDO BAY

BEST COPY AVAILABLE

FLOODING SOURCE	TRANSECT	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND 10% (10-YEAR)	FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3,4] (FEET NGVD)
PERDIDO BAY	29	0240	−4.5[5] −3.0[5]	045 030	V9 A6	7− 8 5− 6
	N/A	0240	−3.0	030	A6	5
	N/A	0240	−3.2	030	A6	6
	30	0240,0245	−5.1[5] −3.5[5]	050 035	V10 A7	8− 9 6− 8
	31	0245	−5.7 −4.0	055 040	V11 A8	8−10 6− 8
	36	0190,0230	−4.0[5]	040	A8	6− 8
	33	0230,0235	−5.9[5] −4.5[5]	060 045	V12 A9	9−10 7− 9
	32	0235,0245	−5.9[5] −4.0[5]	060 040	V12 A8	9−10 7− 9
SANTA ROSA SOUND	N/A	0330,0335,0355, 0360	−3.1	030	A6	6
	N/A	0360	−3.3	035	A7	6

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE IN FEET
[3]ROUNDED TO NEAREST FOOT
[4]DUE TO MAP SCALE LIMITATIONS, BASE FLOOD ELEVATIONS SHOWN ON MAP MAY REPRESENT AVERAGE ELEVATIONS FOR THE ZONES DEPICTED
[5]INCLUDES EFFECTS OF WAVE ACTION

BEST COPY AVAILABLE

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

COASTAL FLOOD INSURANCE ZONE DATA

PERDIDO BAY—SANTA ROSA SOUND

8.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Florida, Washington, D.C., February 1982.

2. Pensacola Beach-Santa Rosa Island Authority, 1984 Population, unpublished data.

3. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Pensacola Beach-Santa Rosa Island Authority, Florida, November 1976.

4. Stottler Stagg & Associates, Development of Flood Damage Reduction Measures in 16-County Area, U.S. Army Corps of Engineers, Mobile District, August 1977.

5. GKY & Associates, Inc., Hurricane Surge Model, Florida Panhandle Communities, Federal Emergency Management Agency, December 1982.

6. U.S. Water Resources Council, Bulletin No. 17A, Guidelines for Determining Flood Flow Frequency, June 1977.

7. U.S. Geological Survey, Water Supply Paper No. 1674, Magnitude and Frequency of Floods in the United States: Part 2B, South Atlantic Slope and Eastern Gulf of Mexico Basins, 1966.

8. U.S. Department of Commerce, Environmental Science Services Administration, Technical Memorandum WBTM Hydro 11, Joint Probability Method of Tide Frequency Analysis Applied to Atlantic City and Long Beach Island, New Jersey, Vance A. Myers, April 1970.

9. ————, NOAA Technical Report NWS 15, Some Climatological Characteristics of Hurricanes and Tropical Storms, Gulf and East Coasts of the United States, Frances P. Ho, Richard W. Schwerdt, and Hugo V. Goodyear, May 1975.

10. ————, National Hurricane Project, Report No. 33, Meteorological Considerations Pertinent to Standard Project Hurricane, Atlantic and Gulf Coasts of the United States, Howard E. Graham, Dwight B. Nunn, November 1959.

11. Federal Emergency Management Agency, Coastal Flooding Storm Surge Model, Part 1, Methodology, February 1981.

12. U.S. Army Corps of Engineers, Coastal Engineering Research Center, Shore Protection Manual, Vicksburg, Mississippi, 1977.

13. Escambia County Department of Community Development, and Henningson, Durham, Richardson and Hart, Inc., Storm Water Management Plan for Escambia and Santa Rosa Counties, May 1974, West Florida Regional Planning Council, June 1974.

14. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles Generalized Computer Program, Davis, California, November 1976.

BEST COPY AVAILABLE

15. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 5 feet: Lillian, Florida-Alabama, 1970; West Pensacola, Florida, 1970; Pensacola, Florida, 1970; Perdido Bay, Florida, 1970; Fort Barrancas, Florida, 1970; Gulf Breeze, Florida, 1969.

16. ————, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 10 feet: Walnut Hill, Florida, 1978; Bratt, Florida, 1978; Century, Florida, 1978; Enon, Florida, 1978; Bay Springs, Florida, 1978; McDavid, Florida, 1978; Barrineau Park, Florida, 1978; Molino, Florida, 1978; Seminole, Florida, 1978; Contanment, Florida, 1978; Pace, Florida, 1978.

17. National Academy of Sciences, Methodology for Calculating Wave Action Effects Associated with Storm Surges, 1977.

18. Federa. Emergency Mangement Agency, Federal Insurance Administration, Users Manual for Wave Height Analysis, revised February 1981.

19. Hill, J.R. and B. Herchenroder, "Computational Model for Computing Dune Erosion," proceedings of ASCE Hydraulics Specialty Conference, Orlando, Florida, August 1985.

20. Florida Department of Natural Resources, Aerial Photographs, Santa Rosa County, Florida, February 1981.

21. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Escambia County, Unincorporated Areas, Florida, September 1977.

22. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Pensacola Beach, Santa Rosa Island Authority, Florida, November 1976.

23. _____, Federal Insurance Administration, Flood Insurance Study, City of Pensacola, Florida, September 1977.

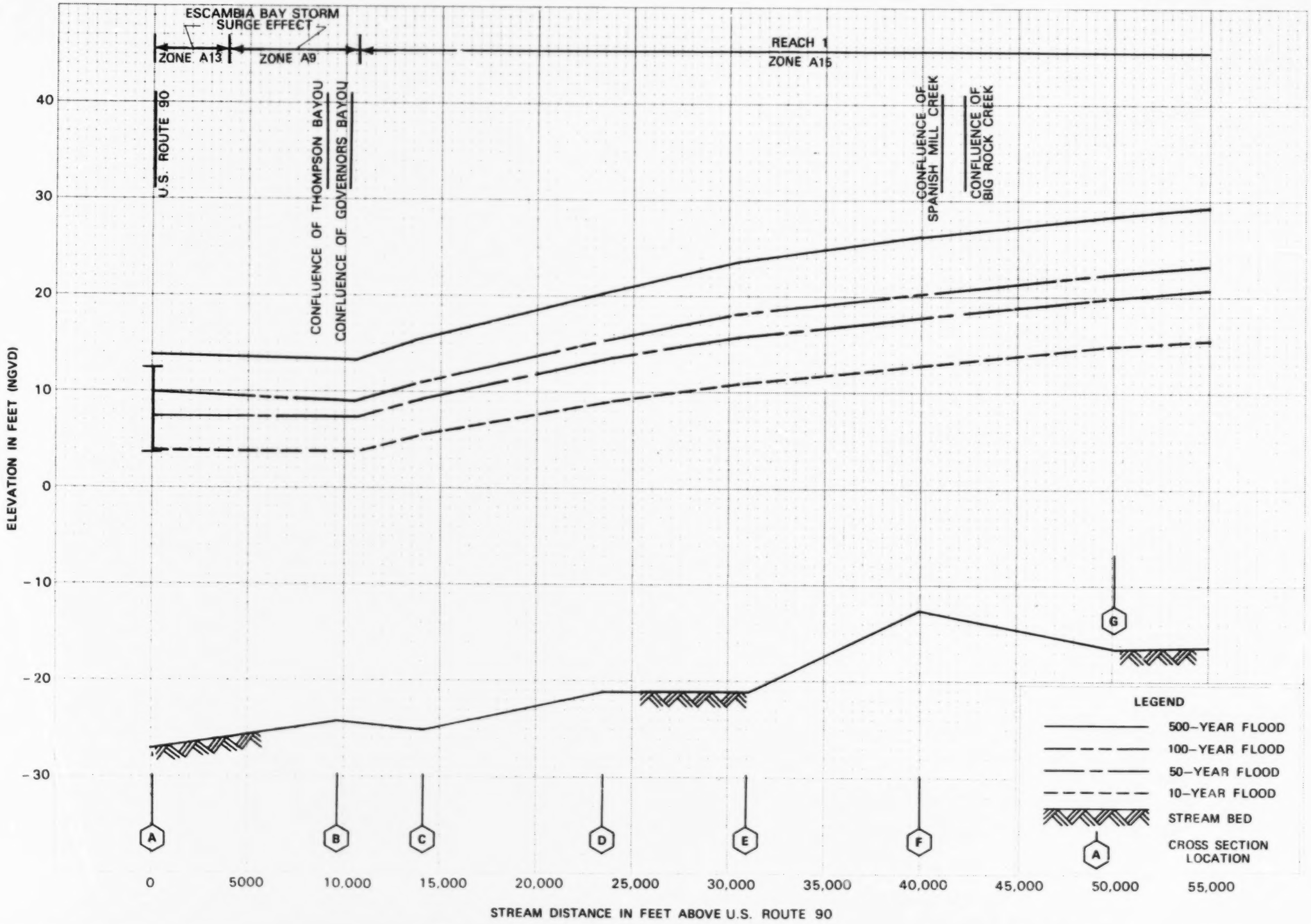
24. ————, Federal Insurance Administration, Flood Insurance Rate Map, Navarre Beach, Escambia County, Florida, April 1977.

25. Federal Emergency Management Agency, Flood Insurance Study, Santa Rosa County, Unincorporated Areas, Florida, in progress.

26. ————, Flood Insurance Study, Baldwin County, Unincorporated Areas, Alabama, in progress.

27. ————, Flood Insurance Study, Town of Flomaton, Escambia County, Alabama, in progress.

BEST COPY AVAILABLE



FLOOD PROFILES

ESCAMBIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

01P

BEST COPY AVAILABLE

REACH 1
ZONE A15

STATE ROAD 184

ELEVATION IN FEET (NGVD)

50
40
30
20
10
0
-10
-20
-30

55,000 60,000 65,000 70,000 75,000 80,000 85,000 90,000 95,000 100,000 105,000 110,000

STREAM DISTANCE IN FEET ABOVE U.S. ROUTE 90

H I J K L M

LEGEND

500-YEAR FLOOD
100-YEAR FLOOD
50-YEAR FLOOD
10-YEAR FLOOD
STREAM BED
A CROSS SECTION LOCATION

FLOOD PROFILES

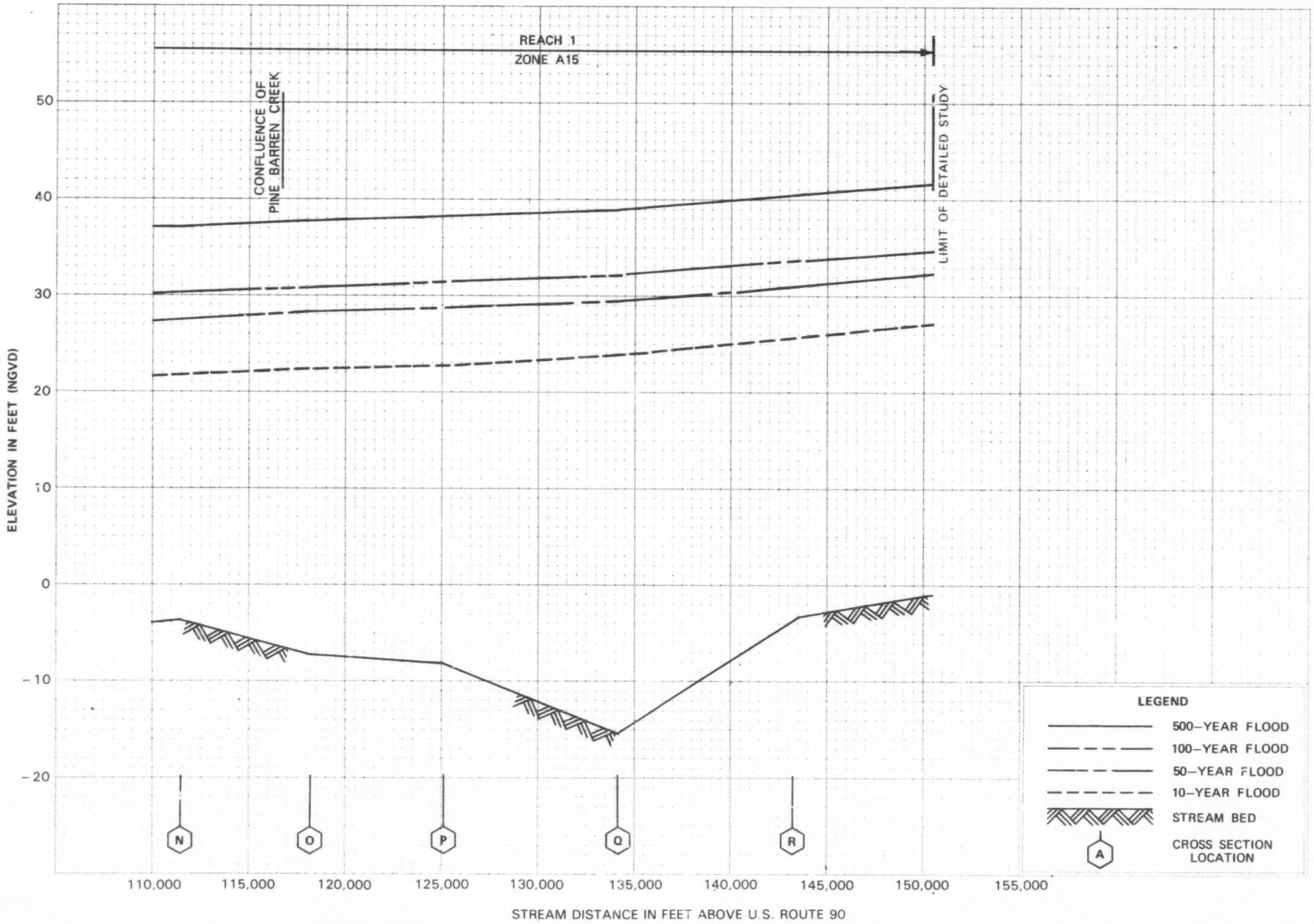
ESCAMBIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

02P

BEST COPY AVAILABLE



FLOOD PROFILES

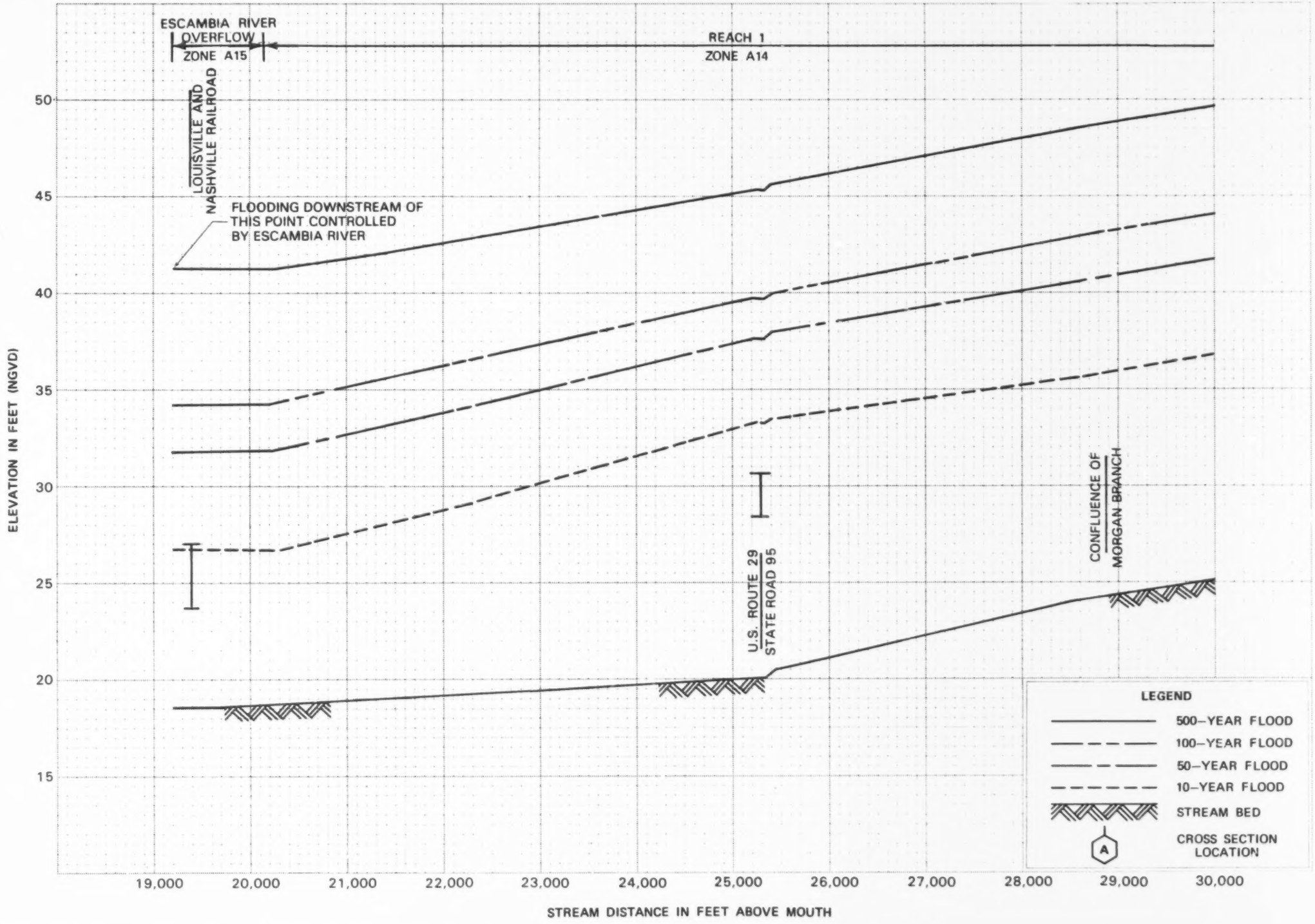
ESCAMBIA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

03P

BEST COPY AVAILABLE



FLOOD PROFILES

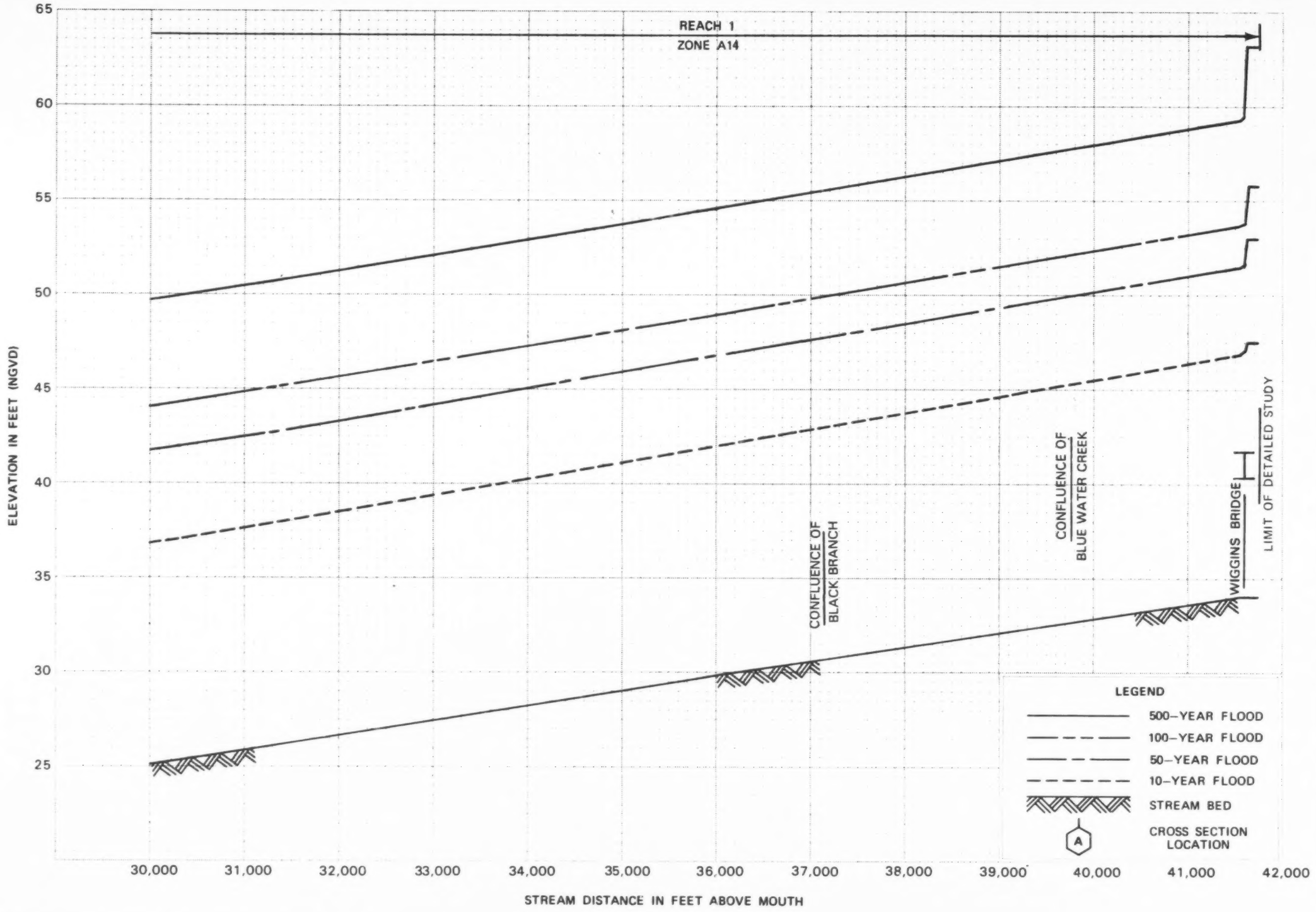
PINE BARREN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

04P

BEST COPY AVAILABLE



FLOOD PROFILES

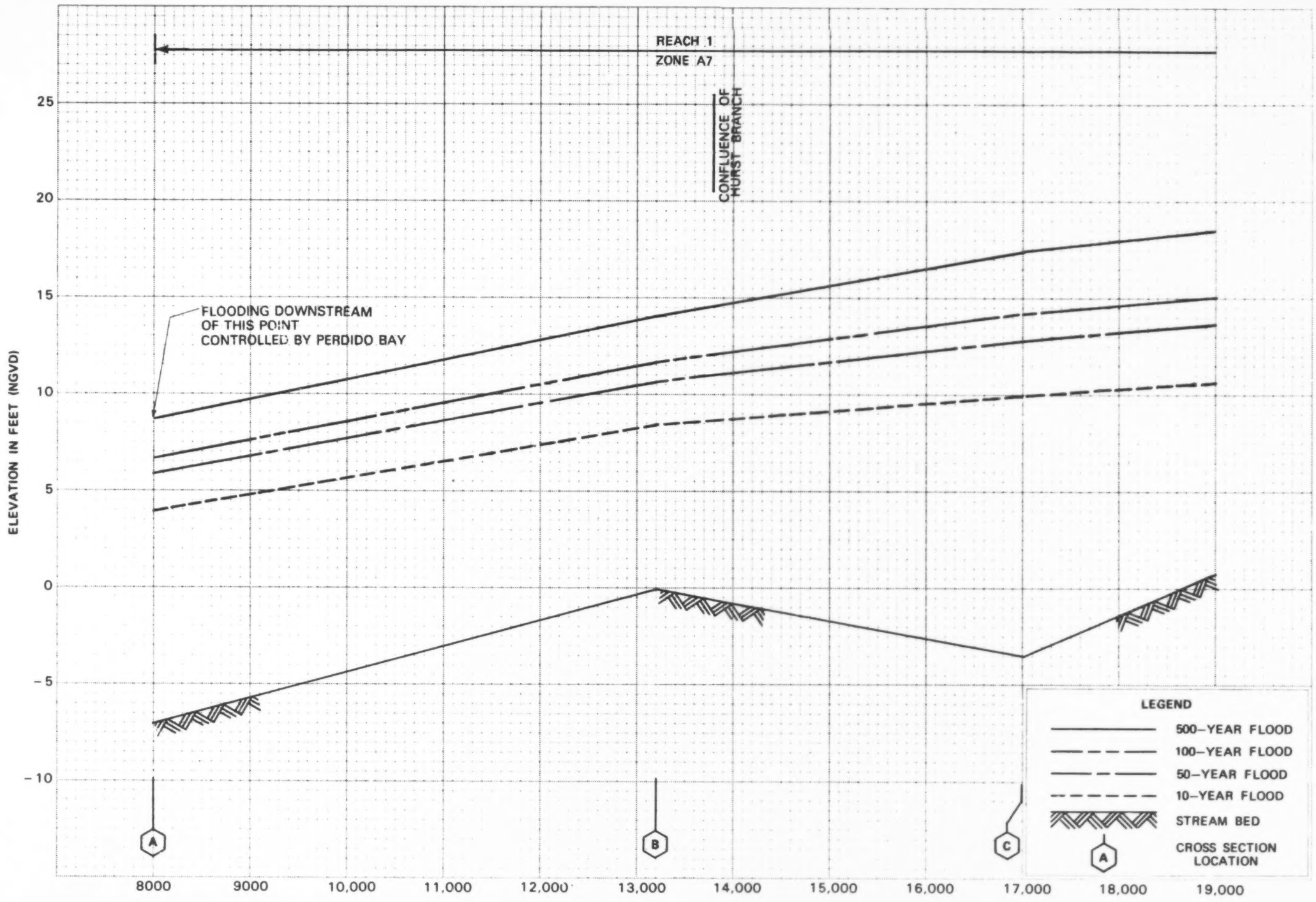
PINE BARREN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

05P

BEST COPY AVAILABLE



FLOOD PROFILES

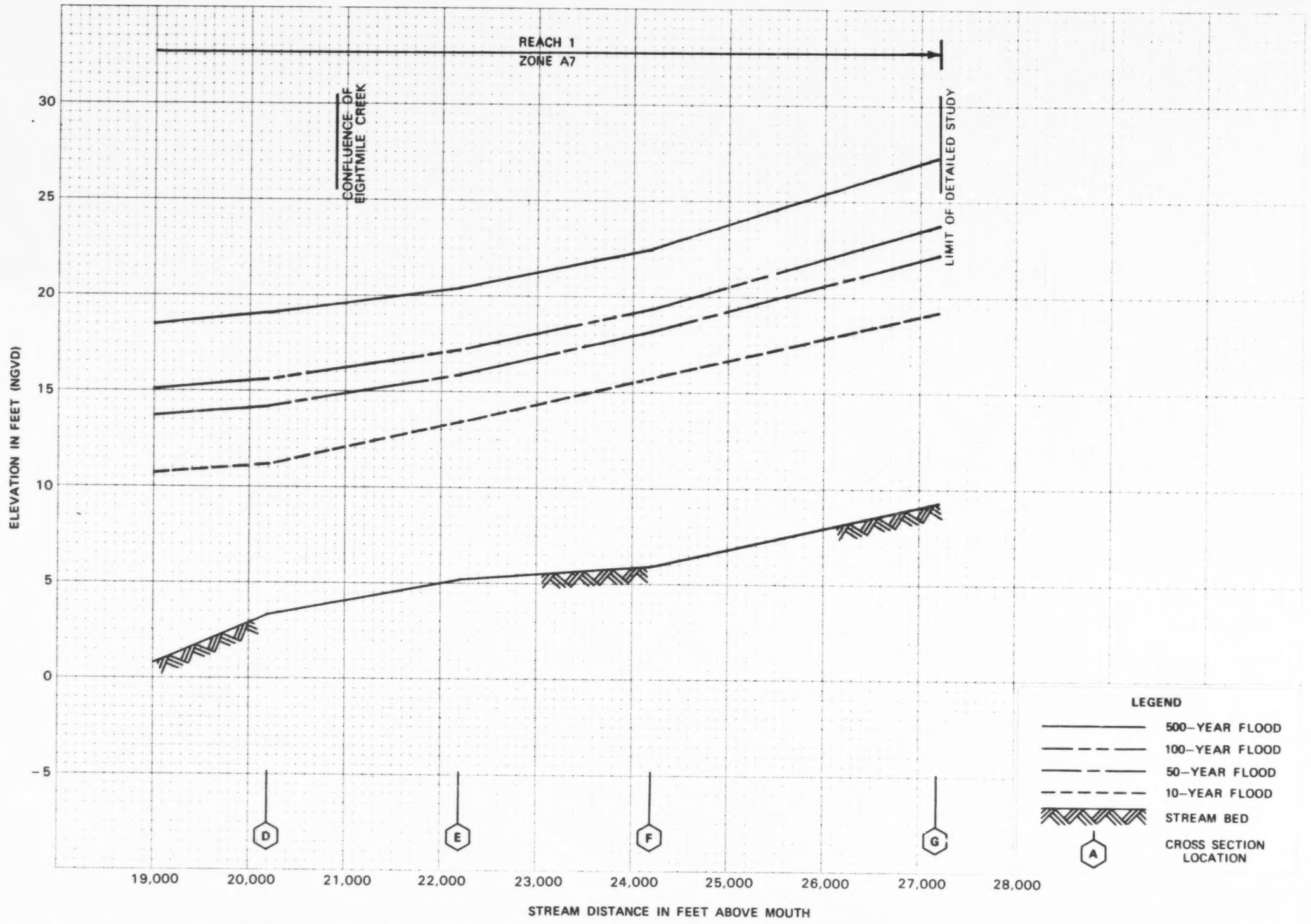
ELEVENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

06P

BEST COPY AVAILABLE



FLOOD PROFILES

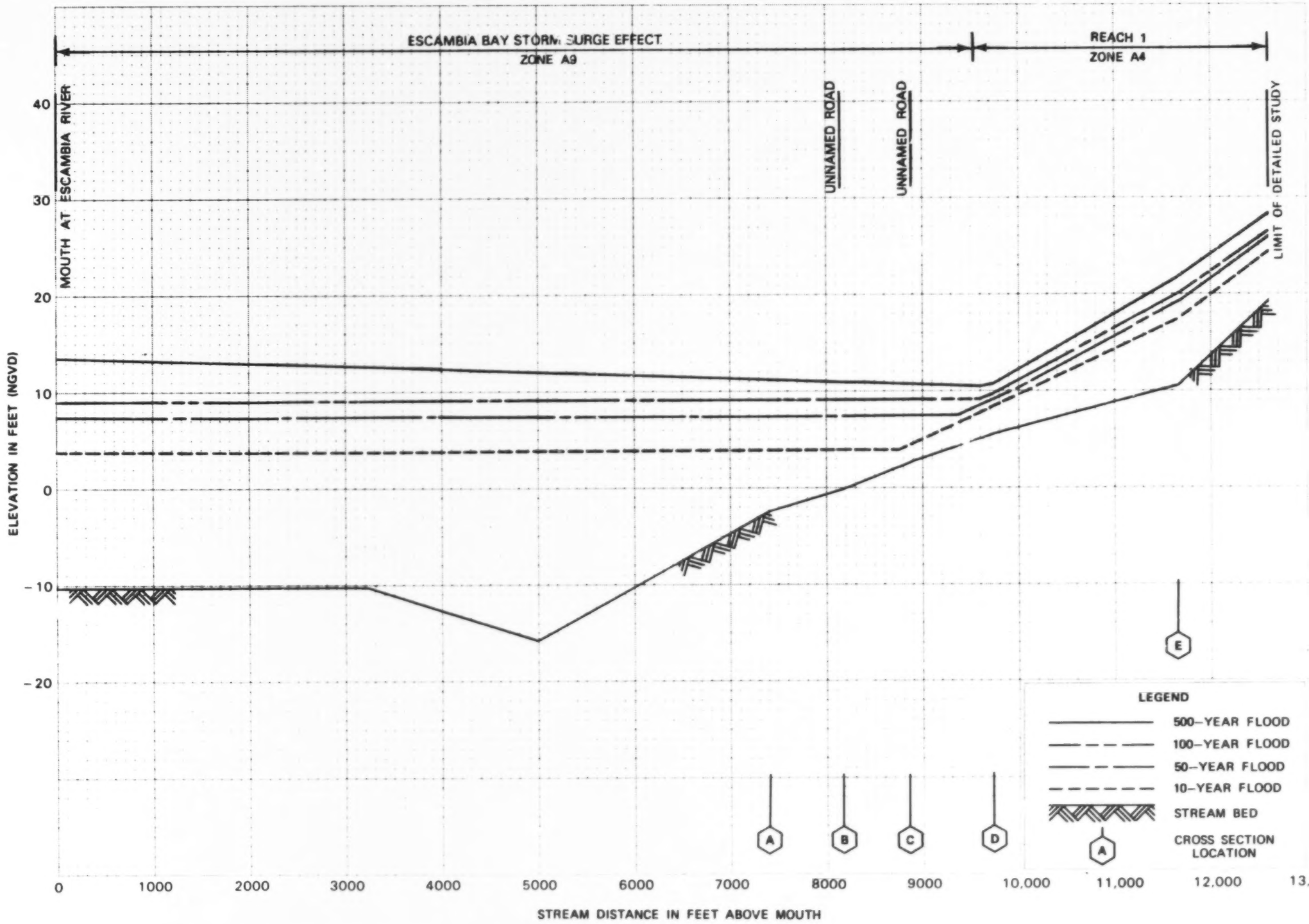
ELEVENMILE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

07P

BEST COPY AVAILABLE



FLOOD PROFILES

THOMPSON BAYOU

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESCAMBIA COUNTY, FL

08P

BEST COPY AVAILABLE